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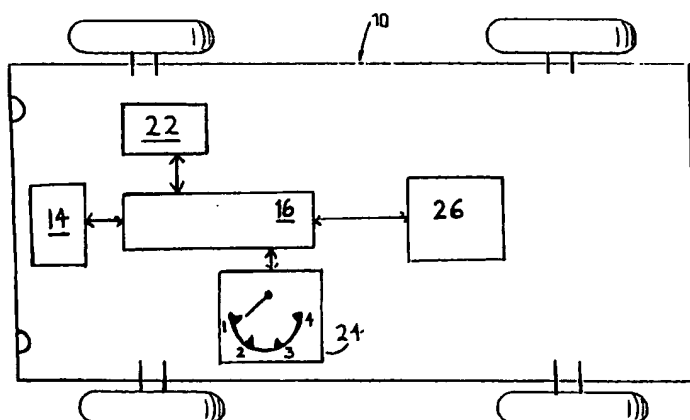
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(54) **A monitoring system**

(57) A monitoring system suitable for a vehicle 10 is disclosed. The system has a display 22 which displays an image of the road area 12 travelled by the vehicle 10. The system further comprises a controller 16 which is capable of allocating differing sets of grey values held in

its memory 26 to the objects 18, 20 in the image. Changes in the allocation of grey values are made in response to a user input, which in a preferred embodiment comprises a grey value allocation switch 24.



**Fig. 1**

## Description

[0001] This invention relates to monitoring systems and in particular, but not exclusively, to a monitoring system which is suitable for a vehicle and includes a monitor means arranged in use to display an image which is built-up using an infra red detection means.

[0002] Infra red transducers, especially those in the 10  $\mu\text{m}$  wavelength range, build up a picture in grey values using the temperature distribution of objects and their background, typically using 8 bit resolution. To achieve this, there must be an assignment of a grey value to each temperature interval. The resulting signal, which may be video, can then be presented on a head-up display (HUD) or on a monitor as, for example, a black and white image.

[0003] The assignment of grey value to temperature intervals has generally been laid out such that brighter grey values relate to higher temperatures and darker grey values relate to lower temperatures.

[0004] Using the previously described assignment of grey values, a person can usually be distinguished quite clearly against a background having a dark grey value. If, however, a user of a vehicle wants to use such a technique to find out the course of a road he is trying to follow, the colder street edgings/kerb stones and the road surface become the darker images and the warmer background of the roadside verges become brighter on the monitor or in the HUD.

[0005] It is a problem with some prior art systems that, depending on the extent of the temperature difference, this picture may prove to be the opposite way round to the desired contrast for efficient road surface monitoring.

[0006] One attempt to overcome this problem is disclosed in EP 0 873 011, in which a system is disclosed where the grey values of a digital infra red camera are changed on the basis of correction parameters. The correction parameters are based on a comparison of grey values to the average. This system, however, may not prove suitable for all driving situations and in addition does not give a user the option of choosing the assignment of grey values which suit their particular wishes or eye sight requirements.

[0007] It is an object of this invention to provide an improved monitoring system.

[0008] Accordingly, the invention provides a monitoring system suitable for a vehicle, the system having a monitor means arranged in use to display an image which is built-up using an infra red detection means, the system being capable of changing the assignment of grey values to the temperature of objects in the image, wherein changes to said assignment are made in response to a user operated input means.

[0009] Said input means may comprise a multi-position switch, each position of which is arranged in use to assign a different set of grey values to high and/or low temperatures.

[0010] Said input means may comprise a voice operated controller arranged in use to assign a different set of grey values to high and/or low temperatures in response to each of a pre-defined set of voice commands.

[0011] Additional changes may be made, or manual changes altered, automatically in response to a driving situation assessment means. Said driving situation assessment means may include an input from a navigation means.

[0012] The invention also provides a vehicle including a monitoring system according to the invention.

[0013] The invention will now be described by way of example only and with reference to accompanying drawings, in which:

Figure 1 is a schematic diagram of a vehicle which includes a monitoring system in accordance with an embodiment of the invention;

Figure 2 represents a driving situation of the vehicle of Figure 1; and

Figure 3 is a table which shows examples of changes which can be made by the monitoring system of Figure 1 to the allocation of grey values to temperature levels of monitored objects, such as those in Figure 2.

[0014] Referring to the figures, a vehicle 10 includes a monitoring system which is used to monitor the road area 12 substantially in the direction of travel of the vehicle 10. The road area 12 is monitored by an infra red detector 14 which provides to a controller 16 the temperature profile of objects 18 and the road surface/edging 20.

[0015] The controller 16 provides a picture of the infra red image it 16 has built up of the road area 12 on a display 22 (such as a monitor or HUD) so as, for example, to help a user make driving decisions. The monitoring system further comprises a user operated input means in the form of a multi-position switch 24.

[0016] In this embodiment, the switch 24 can be moved by a user between four positions 1, 2, 3, 4. The controller 16 is associated with a memory 26, in which is stored the table of Figure 3. This table provides the grey value allocation for each switch position 1, 2, 3, 4 with reference to detected temperature intervals/profiles, e.g. the temperatures of the objects 18, 20 in the image of the road area 12.

[0017] Using the switch 24 and its associated changes 1, 2, 3, 4 to grey value allocation, a user can affect which set of grey values is allocated to each range of objects 18, 20. The user can therefore customise the image on the display 22 to suit their particular eye sight requirements or wishes.

[0018] It is, furthermore, possible to change the displayed image such that it is in fact the road surface 20

which appears brighter than the verges 18. This makes it easier for a user to concentrate on the direction of the road 20 and thereby improve driving safety, especially at night or in conditions of poor visibility, such as in fog.

[0019] Changes to the allocation of grey values could also be made using other user operated means such as a voice operated controller, which could be arranged in use to assign a different set of grey values to high and/or low temperatures in response to each of a pre-defined set of voice commands.

[0020] The changes made to the assignment to objects in the image on the display 22 of particular grey values in response to changes in the current driving situation, are not limited to purely manual changes instigated by a switch means such as the grey value allocation switch 24. The current driving situation can be taken account of in an automatic manner, such that the manual changes to the allocation of grey values could be altered or supplemented automatically by a driving situation assessment means.

[0021] Such a driving situation assessment means can take a variety of forms and could, for example, be implemented in software. It could, for example, be implemented by an expert system on the basis of a controller assessment of the built-up image and surrounding situation or perhaps on the basis of the driving context of the vehicle using an input such as might be obtained from a navigation system. Furthermore, the allocation of grey values to particular temperature intervals need not be linear. Through the freer allocation of grey values to temperatures, a picture could be made adaptive.

#### Claims

1. A monitoring system suitable for a vehicle, the system having a monitor means arranged in use to display an image which is built-up using an infra red detection means, the system being capable of changing the assignment of grey values to the temperature of objects in the image, wherein changes to said assignment are made in response to a user operated input means.
2. A system according to Claim 1, said input means comprising a multi-position switch, each position of which is arranged in use to assign a different set of grey values to high and/or low temperatures.
3. A system according to Claim 2, said input means comprising a voice operated controller arranged in use to assign a different set of grey values to high and/or low temperatures in response to each of a pre-defined set of voice commands.
4. A system according to Claim 1, wherein additional changes can be made, or manual changes altered, automatically in response to a driving situation

assessment means.

5. A system according to Claim 4, wherein said driving situation assessment means includes an input from a navigation means.
6. A monitoring system substantially as described herein and with reference to the accompanying drawings.
7. A vehicle including a monitoring system according to any preceding claim.

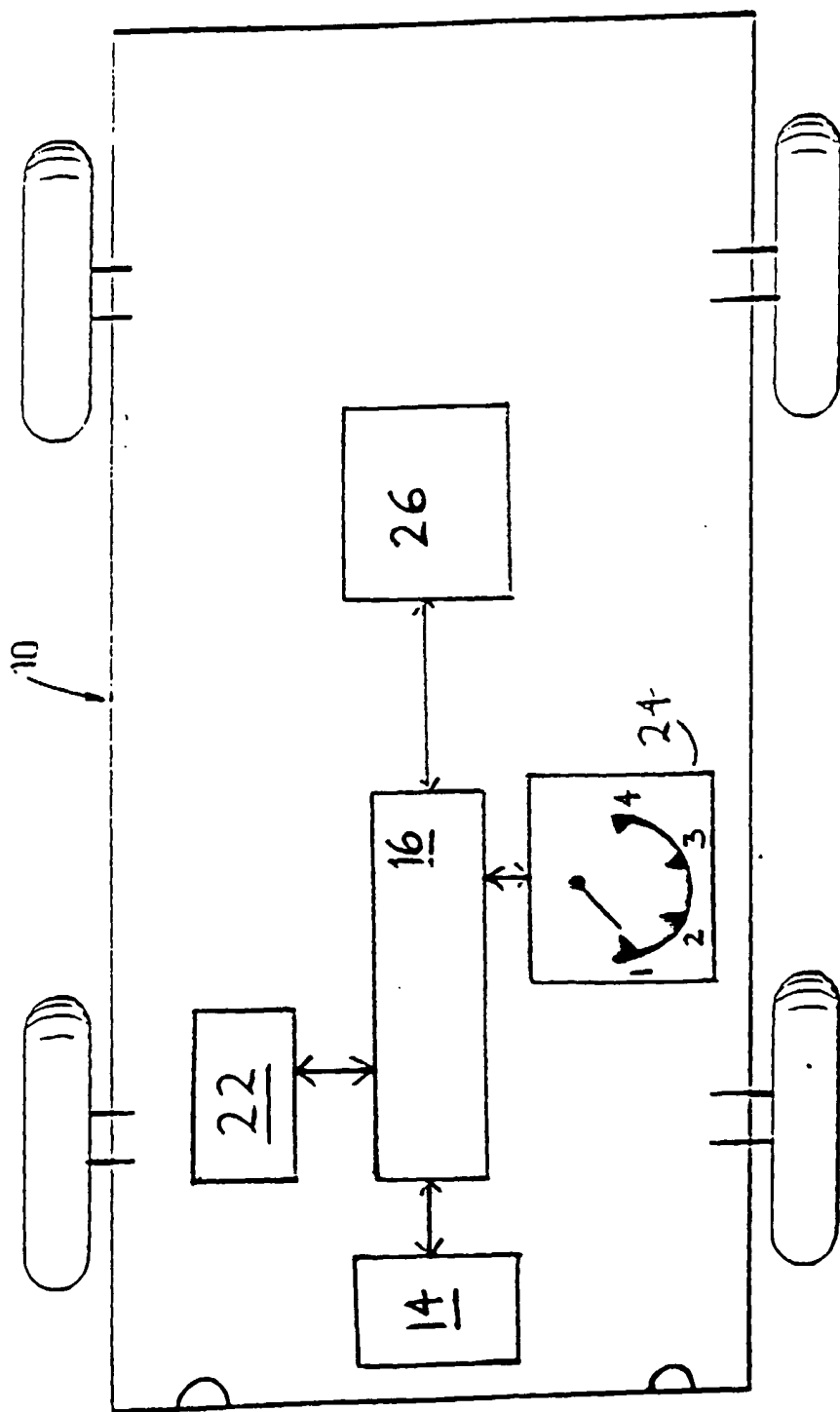
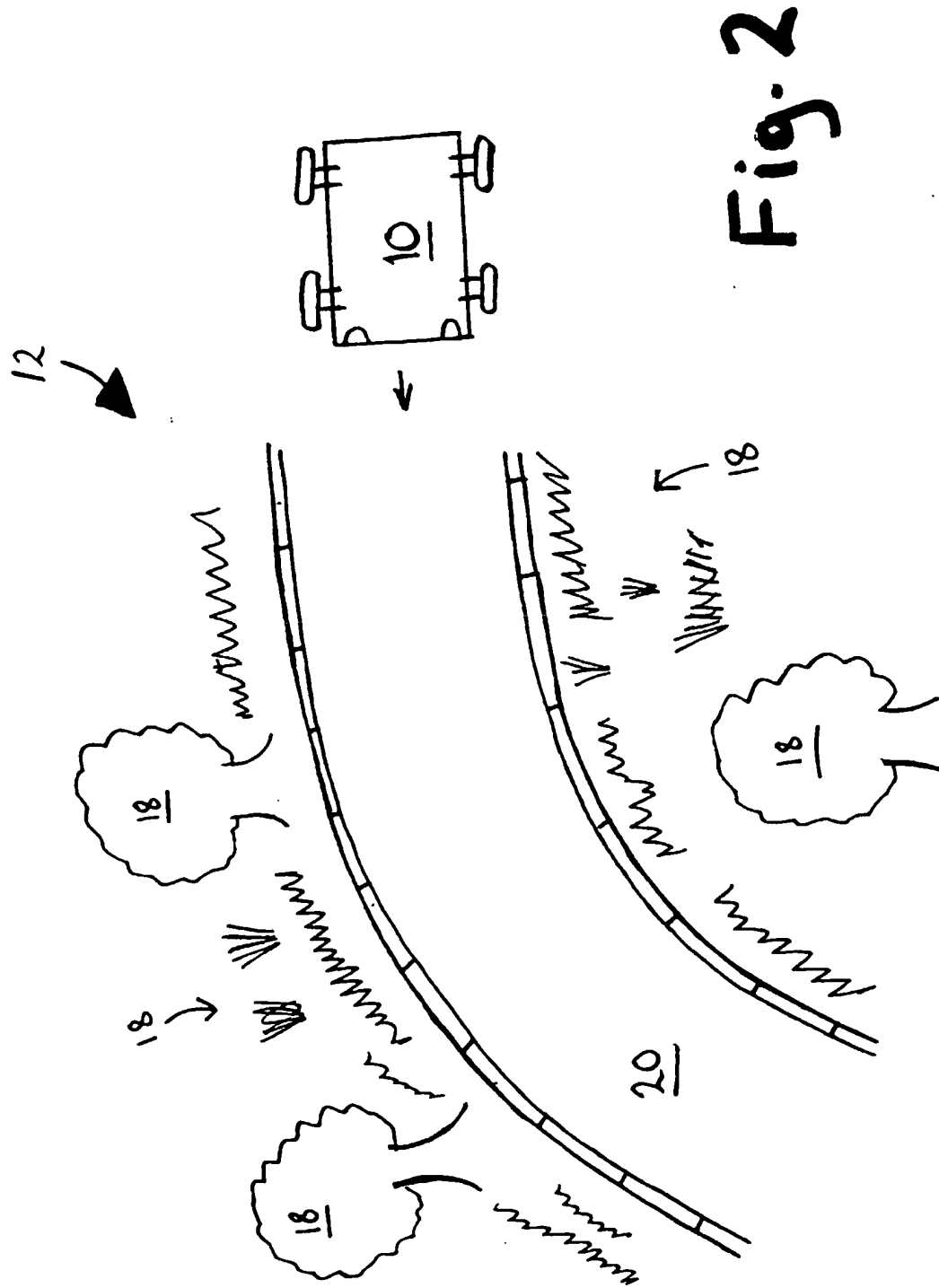


Fig. 1



| TEMPERATURE                   | HIGH   | LOW    |
|-------------------------------|--------|--------|
| GREY VALUE<br>ASSIGNMENT<br>1 | BRIGHT | DARK   |
| 2                             | DARK   | BRIGHT |
| 3                             | BRIGHT | BRIGHT |
| 4                             | DARK   | DARK   |

**Fig. 3**



European Patent  
Office

# EUROPEAN SEARCH REPORT

Application Number

EP 00 11 4380

| DOCUMENTS CONSIDERED TO BE RELEVANT  |  |   |  |
|--|--|---|--|
| Category   | Citation of document with indication, where appropriate, of relevant passages  | Relevant to claim   | CLASSIFICATION OF THE APPLICATION (Int.Cl.7) |
| X  | US 5 619 036 A (SALVIO PAUL ET AL)<br>8 April 1997 (1997-04-08)<br>* column 1, line 36 - column 2, line 23 *<br>* column 3, line 66 - column 4, line 16 *<br>* claim 6 *<br>* figures 1,6 *  | 1-3,6,7   | H04N5/33                                     |
| X  | US 5 001 558 A (BURLEY HARVEY A ET AL)<br>19 March 1991 (1991-03-19)   | 1,6,7   |  |
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|  |  |   | TECHNICAL FIELDS<br>SEARCHED (Int.Cl.7)      |
|  |  |   | H04N<br>B60R                                 |
| The present search report has been drawn up for all claims   |  |   |  |
| Place of search<br><b>THE HAGUE</b>  |  | Date of completion of the search<br><b>20 November 2000</b>   | Examiner<br><b>Didierlaurent, P</b>          |
| CATEGORY OF CITED DOCUMENTS<br>X : particularly relevant if taken alone<br>Y : particularly relevant if combined with another document of the same category<br>A : technological background<br>O : non-written disclosure<br>P : intermediate document |  | T : theory or principle underlying the invention<br>E : earlier patent document, but published on, or after the filing date<br>D : document cited in the application<br>L : document cited for other reasons<br>.....<br>& : member of the same patent family, corresponding document |  |

EPO FORM 1503 03 82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT  
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EP 00 11 4380

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.  
The members are as contained in the European Patent Office EDP file on  
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